

Mindfulness and Stress in The Elderly: Identifying Potential Mediators

Honors Research Thesis

Presented in partial fulfillment of the requirements for graduation  
*with honors research distinction* in Psychology in the undergraduate colleges of The Ohio State  
University

by

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April 2014

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### **Abstract**

Dispositional mindfulness, the ability of an individual to focus on experiences of the present-moment as opposed to being on “auto-pilot”, is known to be associated with lower levels of perceived stress; however, the mechanism by which this occurs is not entirely understood. Current conceptualizations of mindfulness suggest the involvement of increased emotional control and cognitive control in underlying these stress-buffering effects. However, within the elderly, these two controlled processes represent paradoxically divergent trajectories, particularly as age increases, older adults exhibit reduced cognitive control capacities, though emotional control abilities are well-maintained, and at times, enhanced. Our study seeks to examine the role of emotional control and cognitive control as possible mediators of the association between mindfulness and perceived stress. Fifty older adults recruited from the Franklin county area completed self-report measures assessing mindfulness disposition, perceived stress, and emotional control. Additionally, computerized measures of cognitive control assessing working memory, inhibitory control, and set shifting were also administered. We hypothesized a negative correlation between mindfulness disposition and perceived stress, such that participants reporting higher levels of dispositional mindfulness would report lower stress. Additionally, we hypothesized increased difficulties in emotion regulation and lower cognitive control to mediate this relationship. Results, corroborating previous literature, revealed mindfulness disposition and perceived stress were correlated negatively in our older adult population. However, emotion regulation, but not cognitive control, was found to fully mediate the relationship between mindfulness and perceived stress. Our findings reveal the role of enhanced emotional regulation abilities as a potential underlying mechanism contributing to the stress-reducing capacity of dispositional mindfulness in the elderly.

### Introduction

Meditation and meditation-like practices have a range of dampening effects on inflammation processes that are activated during stressful situations (Bushell, 2009). The construct of mindfulness, or a focus on immediate, present-centered experience in a non-judgmental fashion, has been shown to be related to significant reductions in stress within a variety of individuals from healthy adults (Chiesa & Serretti, 2009), cancer patients (Specia, Carlson, Goodey, & Angen, 2000), those with chronic pain and illness (Rosenzweig et al., 2010), health care professionals (Shapiro, Astin, Bishop, & Cordova, 2005), medical students (Shapiro, Schwartz, & Bonner, 1998), and community-dwelling stressed individuals (Baer, 2003; Grossman, Niemann, Schmidt, & Walach, 2004). However, research is limited in explaining the mechanisms of this mindfulness-stress reduction relationship, particularly when examining the relationship between dispositional mindfulness and stress within the elderly (Bishop, 2002; Shapiro, Carlson, Astin, & Freedman, 2006).

Stress is generally defined as the appraisal of a situation as demanding more effort than one's available resources (Lazarus & Folkman, 1984). It can further be classified in various ways: stimulus versus response, acute versus chronic nature, or absolute versus relative stress. However, the central consequence of stress is the triggering of a range of physiological responses. One pathway that is activated is the *hypothalamic–pituitary–adrenal* (HPA) axis, involving the secretion of glucocorticoids (Tsigos & Chrousos, 2002). Glucocorticoid hormones allow for the mobilization of energy needed to execute flight-or-flight responses in stressful situations. However, over-activation of the HPA axis is maladaptive in nature and is accompanied with susceptibility to somatic diseases, as well as cognitive impairment (Tsigos & Chrousos, 2002).

Studies have shown that stress negatively affects executive function, attentional abilities, memory formation, and memory recall (Mendl, 1999). Shifts, lapses, and narrowing of attention are also consequences of stress, as well as decreases in decision speed (Dedovic, D'Aguiar, & Pruessner, 2009). Furthermore, acute psychosocial stress is linked to cognitive impairments and inflexibility during voluntary goal-directed behavior (Plessow, Kiesel, & Kirschbaum, 2012). Importantly, such cognitive impairments are also exhibited in the elderly as a consequence of aging (Kapogiannis & Mattson, 2011). Thus, the impact of mindfulness on stress levels in the context of an older adult population is an important, but relatively understudied area of research.

Mindfulness, which has been associated with stress reduction, has its roots in Eastern and contemplative practices (Brown & Ryan, 2003). Thus, the transfer of this Buddhist-originated practice into western psychological science is conceptually complex and is a construct that has been relatively difficult to define. The contemporary definition of mindfulness, the purposeful direction of attention and non-judgmental observation on a moment-to-moment basis, was proposed by Jon Kabat-Zinn and can be evaluated in terms of both state and trait characteristics (Kabat-Zinn, 2003). Active mindful training entails self-regulation of attention and orienting oneself towards the present experience rather than allowing free-floating thoughts (R. J. Davidson, 2003; Grossman et al., 2004). On the other hand, dispositional mindfulness can be conceptualized as an individual's trait ability to focus on experiences of the present-moment as opposed to being on "auto-pilot" (Brown & Ryan, 2003; Kabat-Zinn, 2003).

Mindfulness practice effects have been more thoroughly studied in the literature, with a focus on the effects of Mindfulness-Based Stress Reduction (MBSR) therapy, which relies on focused concentrative attention and open monitoring of the self (Grossman et al., 2004). In this 8-week program, participants learn mindfulness training and engage in its practice, the end result

being an overall anchoring in the present-moment and the creation of a space of calmness, clarity, and objectivity.

MBSR training has been shown to be effective in a variety of domains and has also evidenced prophylactic benefits in a range of populations. A variety of studies investigating the beneficial impact of active training practice in mindfulness on psychological well-being, distress, and stress levels have been conducted and the majority of these studies have illustrated that moderate effects in stress reduction can be achieved following a course of MBSR training. Grossman et al. (2004) conducted a large meta-analysis of clinical populations, ranging from cancer, pain, heart disease, anxiety, depression, etc. The findings of the review indicated that mean effect size on mental health variables from pre to post-MBSR intervention was  $d = 0.50$ , while the mean effect size on physical health variables was  $d = 0.42$ ; however, specific effect sizes were quite heterogeneously distributed based on the specific patient subgroup involved in each study. In terms of investigating the impact of mindfulness on healthy populations, a meta-analysis conducted by Chiesa & Serretti (2009) identified 10 studies fitting this criteria and found that, in comparison to an inactive controls, MBSR resulted in stress reduction, spiritual enhancement, reductions in ruminating thinking and trait anxiety, and increases in empathy and self-compassion.

Research investigating the relationship between trait mindfulness levels and psychological health have also been assessed using correlational and cross-sectional studies, showing improved mental health and well-being in a number of domains (Keng, Smoski, & Robins, 2011). Mindfulness was negatively associated with impulsivity, anxiety, and hostility, while positively correlated with feelings of autonomy and eudemonic well-being (Brown & Ryan, 2003). In addition, increased mindfulness disposition levels are related to decreased rumination

and psychological distress (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Coffey & Hartman, 2008). Brisbon & Lowery (2011) also found that in both beginner and advanced yoga practitioners, mindfulness, as measured by the Mindful Attention Awareness Scale (MAAS) was significantly negatively correlated with perceived stress via the Perceived Stress Scale (PSS). Furthermore, higher levels of mindfulness also moderated the relationships between perceived stress with depression and perceived stress with perceived health, suggesting salutary effects buffering against the negative impact of stress on psychological health (Bränström, Duncan, & Moskowitz, 2011).

There is also significant evidence that mindfulness practice is effective in enhancing cognitive functioning such as cognition and improved attention (Rapgay & Bystrisky, 2009). Higher levels of mindfulness seem to be associated with a variety of attentional abilities such as selective attention, sustained attention, attention orienting, and working memory capacity (Chambers, Chuen Yee Lo, & Allen, 2008; Fan, McCandliss, Fossella, Flombaum, & Posner, 2005; Jha, Stanley, Kiyonaga, Wong, & Gelfand, 2010; Tang et al., 2007). In addition, a meta-analysis investigating the impact of mindfulness training on cognitive abilities found that two of seven randomized controlled trials (RCT) found significant improvements in sustained attention when comparing mindfulness training group to the control groups, while one RCT reported significant improvements in selective attention following mindfulness training (Chiesa, Calati, & Serretti, 2011). Furthermore, in terms of mindfulness' impact on memory, two studies reported significant improvements in working memory capacity following a 10 day or 4 day mindfulness retreat (Chambers et al., 2008; Zeidan, Johnson, Diamond, David, & Goolkasian, 2010).

Mindfulness has been found to enhance one's overall emotional well-being, as well. Such a mind-body approach has been related to reductions in negative affect and mood by increasing

one's behavioral self-regulation and reducing one's inclination to react emotionally to thoughts and physical sensations (Brown & Ryan, 2003; Bushnell, 2009; Lykins & Baer, 2009; Teasdale et al., 2000). Furthermore, studies have revealed that mindfulness's effectiveness in reducing both negative affect and stress is related to emotional regulation capacity (Arch & Craske, 2010; Chambers et al., 2008). Both trait mindfulness and brief mindfulness training practice are associated with decreased difficulties in emotion regulation (Baer et al., 2006; Erisman & Roemer, 2010). Finally, high dispositional mindfulness is related to a strong inverse association between prefrontal cortex and right amygdala activation, suggesting that more mindful individuals are better able to regulate emotional responses through inhibition of the amygdala via prefrontal control (Creswell, Way, Eisenberger, & Lieberman, 2007).

To date, a limited number of studies investigating the impact of meditation, including mindfulness, in the elderly have been completed (Gard, Hölzel, & Lazar, 2014). An older adult MBSR intervention study found that at a 6-month follow-up, older adults exhibited an increase in positive affect via decreases in depressive symptom severity (Gallegos, Hoerger, Talbot, Moynihan, & Duberstein, 2013). The largest randomized control trial of MBSR in the elderly revealed that following MBSR training, perceived stress did not improve and immune response was lower at follow-up in the MBSR group when compared with the control group (Moynihan et al., 2013). However, older adults' performance on complex executive function tasks improved when standardized for individual processing speeds. This cognitive gain suggests that mindfulness training resulted in enhanced attentional and executive control within the elderly. Furthermore, MBSR training effects were accompanied by increases in left-brain activation, which is linked to positive emotional valence; previous research had found this same effect in

younger adults who completed a MBSR training program, as well (Richard J. Davidson, Jackson, & Kalin, 2000; Mauss & Robinson, 2009).

However, although mindfulness training can be employed as an intervention tool, it is often time consuming and must be conducted long-term before measurable transfer effects are apparent. For example, Moynihan et al. found that older adults' improvements in executive function and left frontal brain activation were not maintained following the completion of the MBSR training (2013). In addition, pretreatment levels of dispositional mindfulness moderated the success of MBSR such that, in comparison to controls, MBSR participants with higher levels of trait mindfulness exhibited larger increases in mindfulness and subjective well-being after completion of the program (Shapiro, Brown, Thoresen, & Plante, 2011). Consequently, the impact of individual trait differences of mindfulness disposition is an important variable to study when considering its impact on stress reduction, especially within the elderly (Brown & Ryan, 2003; Epel, Daubenmier, Moskowitz, Folkman, & Blackburn, 2009).

Given the range of somatic, psychiatric, cognitive, and emotional benefits associated with mindfulness, relatively little is known about the mechanisms that underlie this process. A few studies have begun to theorize the ways in which mindfulness' prophylactic benefits may arise, most of which focus on the concept of directed attention during its meditative practice (Brown & Ryan, 2003). Additional factors that may mediate the mindfulness process include intention and attitude; through the direction of attention in a non-judgmental fashion, de-centering oneself from the situation occurs, which eventually leads towards acceptance of the emotions and experiences at hand (Shapiro et al., 2006). Still, others suggest that exposure, cognitive change, self-management, relaxation, and acceptance are the important underlying factors of mindfulness (Baer, 2003).



A new theoretical framework that places a greater focus on the concept of self-regulation in mindfulness has been proposed. This framework allows for a more encompassing view of mindfulness processes such that self-regulation can be broken into distinct, but interrelated components composed of attention regulation, body awareness, emotion regulation, and change in self-perspective (Hölzel et al., 2011). The belief is that when a stimulus triggers any type of reactivity, the mindful individual first needs to maintain attention on the present moment, which requires effortful goal maintenance via the executive attention system (attention regulation). Next, his or her heightened body awareness allows for detection and labeling of the present-moment feelings and the subsequent response (body awareness). Then, emotion regulatory processes are engaged allowing for prevention of responses and non-reactivity to the present-moment sensations (emotion regulation). Thus, through this transition from attention, awareness, and regulation the moment's experience becomes enhanced, while reactivity is diminished (change in self-perspective). Through the processes of goal-direction and maintenance, as well as self-regulation of emotions, a state of mindfulness can be achieved.

More recently, a new conceptualization of mindfulness, introduced by Vago & Silbersweig (2012) and known as the self-awareness, -regulation, and -transcendence (S-ART) framework, describes a mindfulness process that involves engagement in systematic mental training, and results in reduced self-processing biases and an overall healthy mind through three domains. It is proposed that mindfulness is achieved through the development of (1) meta- or self-awareness, (2) modulation of behavior or self-regulation, and (3) the growth of positive relationships between the self and others which surpasses self-focused needs, known as self-transcendence. The authors propose that it is through facilitation of these types of self-regulation

(of attention, emotion, decentering of oneself, etc.) that S-ART may lead to mindfulness and its many mental and physical benefits.

Thus, these new emerging ideas suggest that higher mindfulness abilities may be the result of enhanced cognitive control; a set of executive control functions that allow for flexibility in information processing to adapt moment-to-moment based on one's goals (Gazzaley, Cooney, Rissman, & D'Esposito, 2005), as well as more effective emotional regulation, or the ability to change one's subjective, emotional experience as well as his or her behavioral expression of emotion (Gross, 1998). Combining together previous research about mindfulness, while integrating new theories and evidence surrounding the importance of cognitive control and emotional control, Prakash, De Leon, Patterson, & Gidwitz (In Review) has proposed a conceptualization of a potential mindfulness mechanism involving the two key constructs of emotion regulation and cognitive control; greater emotional regulation abilities and greater cognitive control abilities may underlie the various prophylactic benefits observed as a consequence of mindfulness. Within the elderly, these two controlled processes represent paradoxically divergent trajectories particularly as age increases.

An emerging theory of aging expands on the idea of inhibitory control decline in the elderly and proposes that the overarching decrease in cognitive control can explain the process by which declines in cognitive performance occur as age increases (Gazzaley et al., 2005). This theory proposes that age-related deficits in the cognitive control of working memory, inhibitory control, and mental flexibility are related to error-prone goal maintenance, which is biased towards irrelevant contextual information. Thus, it is believed that unhealthy aging involves improper attentional filtering, which allows both irrelevant and relevant stimuli to remain salient during task-performance (Gazzaley et al., 2005). Many functional magnetic resonance imaging

(fMRI) studies of older adults have found attentional overprocessing of task-irrelevant information, as well as a general inflexibility in using prefrontal cortex-based cognitive control resources (Gazzaley et al., 2005; Park & Reuter-Lorenz, 2009; Prakash, De Leon, Klatt, Malarkey, & Patterson, 2013; Reuter-Lorenz & Mikels, 2010).

Conversely, although cognitive performance and cognitive control resources may not be efficiently utilized in the elderly, older adults do exhibit enhanced well-being, satisfaction, and emotional processing when compared with younger adults (Charles & Carstensen, 2010). They also show a positivity bias such that when remembering events in the past, older adults recall events more favorably than younger adults, a phenomenon that has been termed the positivity effect (Mather & Carstensen, 2005).

Although a few ideas have been proposed to elucidate this effect, the most prevalent view is the Socioemotional Selectivity Theory (Carstensen, Isaacowitz, & Charles, 1999). This theory postulates that the preference of positive information and events as age increases is the product of a change in goals and motivations due to a shortened perception of time in older adults. By contrast, younger adults exhibit future-oriented goals and do not selectively attend to only positive information. Furthermore, research has pointed to the fact that higher cognitive control, which is critical in goal-orientation, is related to a higher positivity effect in the elderly (Mather & Knight, 2005). Thus, older adults may choose to self-regulate their cognitive resources towards focusing more on positive information, thereby engaging in effortful, top-down emotion regulation processes.

On the whole, aging research in terms of cognitive control and emotional control is still growing. This is especially relevant given that older adults exhibit decreases in cognitive abilities as age progresses. Both cross-sectional and longitudinal studies have been conducted and found

that starting at the age of 30 years, changes in cognition begin and continue to decline linearly throughout the lifespan (Park & Reuter-Lorenz, 2009). Specifically, cognitive performance in capacities such as processing speed, working memory, and executive function are compromised as age increases (Braver & West, 2008; Lindenberger et al., 2008; Park & Reuter-Lorenz, 2009; Salthouse, 2010; Verhaeghen & Cerella, 2008). It is yet unknown what impact cognitive control and mindfulness will have on each other in this elderly population.

Considering the diverse perspectives surrounding the various theories of mindfulness, it would be useful to identify any underlying mechanisms responsible for its process, particularly in determining if cognitive control and emotion regulation may impact the relationship between dispositional mindfulness and reductions in stress. Additionally, given the opposing cognitive control and emotion regulatory processes that occur as a consequence of aging, examining their respective roles in the context of a mindfulness disposition-perceived stress relationship can reveal valuable insights into the mechanisms underlying the process of mindfulness.

Our study examined the association between dispositional mindfulness as measured by a self-report questionnaire and perceived stress. We hypothesized that (a) mindfulness disposition is associated with perceived stress, emotion regulation, and cognitive control in older adults (b) emotion regulation and cognitive control capacity is associated with perceived stress in older adults, (c) the relationship between mindfulness disposition and perceived stress is mediated by emotion regulation and cognitive control capacity. As such, we hope to elucidate the unknown links between mindfulness disposition, stress, cognitive control, and emotion regulation and mindfulness disposition in the elderly.

## **Methods**

### **Site of Study**

This study, with approval from The Ohio State University Institutional Review Board, took place at The Clinical Neuroscience Laboratory in The Ohio State University Department of Psychology.

### **Participant Characteristics**

Fifty older adult participants (mean age = 65.34 years, 64% female, mean education = 17.02 years) were recruited from the Franklin county area to participate in this study. The age range of our older adult participants was 60-79 with an s.d. of 4.80 years. The sample was drawn from a larger study that investigated the neural and behavioral correlates of mindfulness and emotion regulation in young and older adults. Recruitment tools consisted of newspaper and newsletter advertisements, flyers posted around the community, and presentations given at senior centers.

Participant inclusionary criteria included falling between the ages of 60-80 years, a score >23 on the Mini-Mental Status Examination (MMSE; maximum score = 30; Folstein, Folstein, & McHugh, 1975), a score of <10 on the Geriatric Depression Scale (GDS), corrected near and far acuity of 20/40 or better, right-handedness as assessed by the Edinburgh Handedness Inventory, no history of psychiatric or neurologic disorders, untreated hypertension, or chronic inflammatory diseases, and no regular use of steroid medication or hormone replacement therapy. All participants provided written informed consent before participating.

### **Procedure**

In order to determine eligibility, potential participants underwent a short phone-screening interview, lasting about 10-15 minutes. Data for this current study was collected at study Session 1 and study Session 2, which typically took place about one week apart. Participants completed computerized cognitive tasks during Session 1. In the period between Sessions 1 and 2,

participants completed self-report questionnaires and these questionnaires were collected at Session 2. All participants were compensated for their time.

### **Questionnaires**

**Mindful Attention Awareness Scale.** The Mindful Attention Awareness Scale (MAAS; (Brown & Ryan, 2003) is 15-item self-report questionnaire scored on a 6-point Likert scale from 1 (Almost Always) to 6 (Almost Never), which assesses the experience of mindfulness in a general, everyday context. Mindfulness is measured on the basis of attention and awareness of thought, emotions, and actions. Higher scores on the MAAS reflect higher levels of mindfulness disposition. The MAAS has been shown to have good reliability and validity (Brown & Ryan, 2003), as well as having been used in a variety of populations such as in adolescents, cancer patients, and healthy adults (Brown, West, Loverich, & Biegel, 2011; Carlson & Brown, 2005; MacKillop & Anderson, 2007). An example statement is, “I rush through activities without really being attentive to them.” Please see Appendix 1. Cronbach’s  $\alpha = .760$ .

**Perceived Stress Scale.** The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) is a 10-item self-report questionnaire scored on a 5-point Likert scale from 0 (Never) to 4 (Very Often), which measures the perception and appraisal of stress in one’s life. Higher scores on the PSS reflect higher levels of stress and more feelings of unpredictability, uncontrollability, and overloadedness. Example item from the scale is, “In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?” Please see Appendix 2. Cronbach’s  $\alpha = .855$ .

**Difficulties in Emotion Regulation.** The Difficulties in Emotion Regulation (DERS; Gratz & Roemer, 2008) is a 36-item self-report questionnaire measured on a 5-point Likert scale from 1 (Almost Never) to 6 (Almost Always), which evaluates emotion regulation difficulties

with nuanced subscales: non-acceptance of emotional responses (non-acceptance), difficulties in engaging in goal-directed behavior (goals), impulse control difficulties (impulse), lack of emotional awareness (aware), limited access to emotion regulation strategies (strategies), lack of emotional clarity (clarity). Higher scores on this scale indicate greater perceived difficulties in emotion regulation capabilities; some items on this scale are reverse scored. An example item from the questionnaire includes, “When I’m upset, I feel like I can remain in control of my behaviors.” (reverse-scored; impulse control). Please see Appendix 3. Cronbach’s alpha = .902.

**White Bear Suppression Inventory.** The White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994) is a 15-item self-report questionnaire measured on a 5-point Likert scale from A (1; Strongly Disagree) to E (5; Strongly Agree), which evaluates thought suppression. Higher scores on this scale indicate greater tendencies to suppress thought. An example item from the questionnaire includes, “I always try to put problems out of mind.” Please see Appendix 4. Cronbach’s alpha = .896.

### **Cognitive Measures**

**N-back Task.** The N-back task is an assessment of working-memory through a block-design of varying memory loads (Jaeggi, Buschkuhl, Perrig, & Meier, 2010). In each block, 1-back and 2-back, participants were presented with a series of letters which appeared one at a time and were asked to determine whether the letter presented on the screen matched the one immediately prior (1-back) or matched the letter that presented two letters prior (2-back). Participants responded using their right-index finger for a match and responded with their left-index finger for no match. Each of the two blocks was presented twice in a randomized order. Instructions screens lasted for 3000 ms and were presented at the start of each block in order to instruct participants of the upcoming condition. Each of the conditions consisted of 30 trials

where each letter was presented on the monitor screen for 1500 ms, following by 1500 ms to give the participant time for a response; the inter-stimulus interval was 1500 ms, as well. Fixation blocks were interleaved prior to the instruction screens and after the task blocks, each lasting for 4500 ms. The entire task lasted approximately 8 minutes.

The dependent measure of interest was the N-back cost, or the cost associated with performance in response to increasing working memory load from the 1-back to 2-back blocks. The N-back reaction time (RT) cost (NbackRTCost) was calculated by taking the difference of the 1-back block RT from the 2-back block RT (2-back RT – 1-back RT). Accuracy (Acc), as working memory load increased (NbackAccCost), was also assessed by taking the difference of the 2-back block accuracy from the 1-back block accuracy (1-back Acc – 2-back Acc), representing the decrease in accuracy as task difficulty increased. Figure 1 illustrates the schematic of the N-Back Task.

**Flanker Task.** The Flanker task measures cognitive control by assessing attention and inhibitory control capacity (Eriksen & Eriksen, 1974). The task consists of participants being presented with a series of five arrows on a computer monitor for a short period of time, whereby the arrows pointed in either one direction or opposing directions, left or right (e.g. <<<<< or >>>>>). Participants were asked to identify the orientation of the central arrow while ignoring the orientation of the peripheral arrows. If the central arrow pointed to the left, the participant was instructed to press the 'z' key with their left index finger, while if the central arrow pointed to the right, they were instructed to press the '/' key with their right index finger. Each trial began with a fixation cross for 400 ms followed by the stimulus for 1500 ms. There were 100 trials with each condition presented 50 times, congruent or incongruent. Trials were also



counterbalanced so that 50% of the arrows pointed left and 50% of the arrows pointed right. The entire task duration lasted approximately 5 minutes.

Failures to selectively attend to the task goal (the directionality of the central arrow) and ignore irrelevant information (the flanking arrows) can be identified by increases in reaction time and decreases in accuracy during the incongruent trials when compared with performance on congruent trials. Flanker reaction time cost (FlankerRTCost) was calculated by taking the difference between reaction time on congruent trials from incongruent trial performance ( $\text{FlankerIncRT} - \text{FlankerConRT}$ ), while flanker accuracy cost (FlankerAccCost) was calculated by taking the difference between accuracy on incongruent trials from congruent trial performance ( $\text{FlankerConAcc} - \text{FlankerIncAcc}$ ). Figure 2 illustrates the schematic of the Flanker task.

**Task Switching Paradigm.** The Task Switching paradigm is a measure of set shifting capacity where participants were asked to perform two different tasks in trial blocks that were task-specific and also perform in trial blocks that unpredictably switched between tasks (Jersild, 1927; Spector & Biederman, 1976). On one task, participants were asked to determine whether the number presented on the computer monitor was less than or greater than 5, while the other task involved determining whether the number presented was odd or even. Each number was presented individually for 1500 ms against a blue or pink background at the center of the monitor screen. The color of the background on which the number was presented served to orient the participant to perform according to the directions of one task over another; a blue background corresponded to responding to high/low instructions, while a pink background corresponded to responding to odd/even instructions. Participants completed four single task blocks of 30 trials each, 2 blocks of the high/low and 2 blocks of the odd/even. They then completed a dual task

block where the task instructions for each trial, based on the presentation of background color, was chosen at random for a total of 160 trials. This entire task lasted approximately 12 minutes and modeled to that of Kramer, Hahn, & Gopher (1999) and Pashler (2000)'s tasks.

The dependent variables of interest included the switch costs associated with maintaining two attention sets (local cost) and the switch cost associated with shifting between tasks during the presentation of the dual task block (global cost). Global switch costs in reaction time (TSGlobalRTCost) were calculated by taking the difference in reaction times of the single trials of the single blocks from the repeat trials of the dual block ( $TSRepeatRT - TSSingleRT$ ); the global switch costs in accuracy (TSGlobalAccCost) were calculated by taking the difference in accuracy of the repeat trials of the dual block from the single trials of the single blocks ( $TSSingleAcc - TSRepeatAcc$ ). Local switch costs in reaction time (TSLocalRTCost) were calculated by taking the difference in reaction times of the switch trials in the dual task block from the repeat trials in the dual task block ( $TSSwitchRT - TSRepeatRT$ ); the local switch costs in accuracy (TSLocalAccCost) were calculated by taking the difference in accuracy of the repeat trials in the dual task block from the accuracy performance of the switch trials in the dual task block ( $TSRepeatAcc - TSSwitchAcc$ ). Figure 3 illustrates the schematic of the Task Switching Paradigm.

### **Data Analytic Strategy**

Data for 50 older adult participants were collected. All data was tested for normality and outliers. Normality was determined by examining the Kolmogorov-Smirnov test, followed by appropriate data transformations.

We conducted analyses to test the hypotheses that (a) mindfulness disposition is associated with perceived stress, emotion regulation, and cognitive control in older adults (b)

emotion regulation and cognitive control capacity is associated with perceived stress in older adults (c) the relationship between mindfulness disposition and perceived stress is mediated by both emotion regulation and cognitive control capacity in older adults.

Using Baron & Kenny's (1986) method of evaluating mediation, we first conducted linear regression analyses examining the associations between mindfulness disposition, perceived stress, difficulties in emotion regulation, and cognitive control. Next, we examined whether the relationship between mindfulness disposition and perceived stress was mediated by participants' emotion regulation capacity through their perceived difficulties in emotion regulation and tendencies towards thought suppression, and participants' cognitive control capacity via reaction time and accuracy costs in working memory, inhibitory control, and set shifting tasks. We also employed bias-corrected bootstrapping techniques with 5000 bootstrap samples to estimate the confidence interval (CI) of the indirect effects. Bootstrapping mediation tests are preferred over other mediation methods because they do not assume a normal sampling distribution of the indirect effects (Preacher & Hayes, 2008). All analyses were performed using SPSS 20.0 (IBM, New York).

## Results

Standardized beta coefficients are reported. Correlation matrices of the primary study variables are presented in Tables 2 and 3.

### Primary Analyses

**Mindfulness disposition associations with perceived stress, emotion regulation, and cognitive control in older adults.** First, linear regression analyses were conducted with mindfulness disposition predicting perceived stress. As expected, higher levels of mindfulness disposition were associated with lower levels of perceived stress in older adults ( $b = -.39, t(46) =$

-2.91,  $p = .006$ ). Mindfulness disposition also explained a significant proportion of variance in perceived stress levels ( $R^2 = .155$ ,  $F(1, 46) = 8.47$ ,  $p = .006$ ).

In order to determine the associations between mindfulness and emotional control, linear regression analyses were conducted with mindfulness disposition predicting decreased difficulties in emotion regulation, as well as mindfulness disposition predicting decreased tendencies towards thought suppression. As per our hypothesis, higher levels of mindfulness disposition were associated with decreased difficulties in emotion regulation ( $b = -.54$ ,  $t(48) = -4.42$ ,  $p < .001$ ) and decreased tendency towards thought suppression ( $b = -.34$ ,  $t(48) = -2.48$ ,  $p = .017$ ) in older adults. Again, mindfulness disposition explained a significant proportion of variance in difficulties in emotion regulation ( $R^2 = .289$ ,  $F(1, 48) = 19.55$ ,  $p < .001$ ) and tendency towards thought suppression ( $R^2 = .114$ ,  $F(1, 48) = 6.15$ ,  $p = .017$ ).

Next, the relationship between mindfulness disposition and cognitive control was evaluated. Contrary to our hypothesis, there was no relationship between dispositional mindfulness and cognitive control in older adults on any variable of cognitive control; see Table 3 for standardized beta coefficient values for the relationship between mindfulness disposition and cognitive control capacities via working memory (NbackRTCost and NbackAccCost), inhibitory control (FlankerRTCost and FlankerAccCost), and set shifting (TSGlobalRTCost, TSGlobalAccCost, TSLocalRTCost, TSLocalAccCost).

**Emotion regulation and cognitive control capacity associations with perceived stress in older adults.** Linear regression analyses were conducted in order to investigate the association between emotional control and stress, and cognitive control and stress, with perceived stress serving as the dependent variable. There was a positive association between difficulties in emotion regulation and perceived stress ( $b = .54$ ,  $t(46) = 4.33$ ,  $p < .001$ ) and a positive

relationship between tendency towards thought suppression and perceived stress ( $b = .44$ ,  $t(46) = 3.27$ ,  $p = .002$ ) in our older adult sample. Difficulties in emotion regulation explained a significant proportion of variance in perceived stress levels ( $R^2 = .290$ ,  $F(1, 46) = 18.75$ ,  $p = < .001$ ). In addition, tendency towards thought suppression also explained a significant proportion of variance in perceived stress levels ( $R^2 = .189$ ,  $F(1, 46) = 10.71$ ,  $p = .002$ ).

When examining cognitive control's association with stress, no significant relationship between cognitive control capacity and perceived stress levels was found; refer to Table 3 for standardized beta coefficient values for the relationship between perceived stress and cognitive control abilities via working memory (NbackRTCost and NbackAccCost), inhibitory control (FlankerRTCost and FlankerAccCost), and set shifting (TSGlobalRTCost, TSGlobalAccCost, TSLocalRTCost, TSLocalAccCost).

**Testing for potential mediation of the association between mindfulness disposition and perceived stress in older adults.** A hierarchical multiple regression analysis was performed with mindfulness disposition, difficulties in emotion regulation, and tendencies towards thought suppression acting as predictor variables, while perceived stress served as the dependent variable. As predicted, the relationship between dispositional mindfulness and perceived stress was fully mediated by emotional regulation capacity in older adults (Figure 4). In other words, higher levels of mindfulness disposition were associated with lower perceived stress levels in older adults, and this relationship was fully explained by decreased difficulties in emotion regulation and decreased tendency towards thought suppression ( $R^2 = .155$ ,  $R^2 = .330$ ,  $R^2\text{change} = .070$ ,  $\beta = -.140$ ,  $p = .343$ ). The associated 95% confidence interval obtained by bootstrapping (Preacher & Hayes, 2008) for this indirect effect equaled  $-.03$  (95% CI from  $-.04$  to  $-.01$ ). Given that this 95% CI does not equal zero, this mediation effect is considered to be significant at the 0.05 alpha level.

These analyses indicate that after taking into account emotional control via difficulties in emotion regulation and tendency towards thought suppression, mindfulness disposition was no longer associated with perceived stress. Because the indirect effect of mindfulness disposition on perceived stress is no longer significant, we conclude that the effect of mindfulness disposition on perceived stress is fully explained, or fully mediated, by emotion regulation capacity.

Given that there was no relationship between cognitive control capacity and mindfulness disposition, nor cognitive control capacity and perceived stress, no mediation by cognitive control in older adults was possible.

### **Discussion**

The purpose of the present study was to examine the association between dispositional mindfulness and perceived stress, and identify potential mediators of this relationship, particularly in the elderly. We were especially interested in investigating the association between emotional control and cognitive control with mindfulness and perceived stress. The results of our study, corroborating previous literature, confirmed our hypothesis that mindfulness disposition is negatively associated with perceived stress in the elderly. Furthermore, our findings revealed that emotion regulation capacity fully mediated the negative association between mindfulness disposition and perceived stress; however, cognitive control was not associated with either mindfulness disposition, or perceived stress in older adults. The results from this study highlight the role of enhanced emotional regulation abilities as a potential underlying mechanism contributing to the stress-reducing capacity of dispositional mindfulness in the elderly.

Consistent with prior literature, our findings provide additional evidence of the positive psychological health benefits associated with mindfulness, particularly in the area of stress-reduction. For instance, a review of randomized controlled trials (RCTs) investigating the

effectiveness of MBSR on a variety of symptoms established that MBSR resulted in significant reductions in perceived stress in 7 of 8 RCTs, with pre-post effect sizes ranging from 0.3-0.64 (Fjorback, Arendt, Ørnbøl, Fink, & Walach, 2011). In addition, Baer, Carmody, & Hunsinger (2012) examined the trajectory of changes in mindfulness levels and perceived stress levels through weekly assessments throughout an 8-week MBSR program. Those findings revealed that mindfulness levels significantly improved while stress levels significantly decreased from pre- to post-treatment, though weekly changes in perceived stress were not significant until the last week of the program, alluding to the fact that changes in mindfulness precede changes in stress levels.

However, when it comes to investigating the relationship between mindfulness and stress in an elderly population, the research literature is limited. Among the few studies that have investigated mindfulness and stress in the context of this population is Moynihan et al. (2013) who conducted the largest randomized control trial of MBSR in an older adult population. This study found that perceived stress did not improve in older adults after completion of MBSR training when compared with controls. However, it is important to note that the Moynihan study was a RCT, where participants underwent an 8-week training in principles and practices of mindfulness. Our study was a cross-sectional examination of the trait of mindfulness, and its associations with levels of perceived stress.

Although much has been studied in terms of mindfulness's associations with improved psychological health and its stress-reducing effects, increasing effort is being directed at understanding the mechanisms through which mindfulness is associated with a range of benefits. Our findings highlight the idea that emotion regulation plays a central, mediating role, in the relationship between mindfulness and stress. Previous research lends support to this concept of

emotional control acting as an underlying mechanism of mindfulness. First, high dispositional mindfulness is related to a strong inverse association between prefrontal cortex and right amygdala activation, suggesting that more mindful individuals are better able to regulate emotional responses through inhibition of the amygdala via prefrontal control (Creswell et al., 2007). In addition, both trait mindfulness and brief mindfulness training practice were associated with decreased difficulties in emotion regulation (Baer et al., 2006; Erisman & Roemer, 2010). Furthermore, a central feature of a proposed theoretical framework of mindfulness by Hölzel et al. (2011) involves emotion regulatory processes, which facilitates non-reactivity to present-moment sensations; an important principle of mindfulness. Finally, Garland et al. found that after the completion of an 8-week mindfulness intervention, dispositional mindfulness significantly increased while perceived stress significantly decreased; additionally, increases in positive reappraisal were found to partially mediate this relationship in a population of community-dwelling middle-age adults (Garland, Gaylord, & Fredrickson, 2011).

Consistent with the literature, when we examined the results of study in the context of emotional control and perceived stress we discovered that better emotion regulation abilities mediated the dispositional mindfulness and perceived stress relationship in older adults. There existed a positive association between difficulties in emotion regulation and perceived stress levels, as well as an association between tendencies towards thought suppression and perceived stress levels in older adults. This finding adds to what previous research has found; emotion regulation abilities increase with age such that older adults become better at emotion regulation and exhibit a positivity bias when compared with younger adults (Charles & Carstensen, 2010; Mather & Carstensen, 2005). In addition, adults who endorsed increased mindfulness disposition levels exhibited increased psychological flexibility through the Acceptance and Action



Questionnaire II, and were more likely to report adaptive emotional schemas via the Leahy Emotional Schema Scale (Silberstein, Tirch, Leahy, & McGinn, 2012). Taken together, our research demonstrates that emotional control in the elderly, a population who has superior emotion regulatory abilities when compared to younger adults, fully mediates the relationship between mindfulness and stress through more adaptive emotion regulation ability. This, along with previous literature surrounding the relationship between mindfulness and emotion, lends support to the idea that enhanced emotional control is a key feature that may underlie the mechanisms of mindfulness and its numerous, subsequent benefits.

Just as older adults exhibit a particular aging trajectory in terms of emotional control, they also exhibit a specific, inverse trajectory related to cognitive control, such that one's ability to perform fluid tasks related to working memory, inhibitory control, and set shifting decline with age (Park & Reuter-Lorenz, 2009). However, our study did not find any significant relationship between cognitive control and stress, and between cognitive control and mindfulness in older adults. Previous literature with older adults has shown that following MBSR training, participants evidenced small, though statistically significant changes in both mindfulness and executive function related, although these effects were not maintained at follow-up (Moynihan et al., 2013). In general, research with older adults participants in the context of mindfulness and cognitive control is very limited and should be studied further.

Much of the literature reporting improved cognitive control following mindfulness intervention consists of young adult samples. For example, young adults' attentional orienting improved following an 8-week MBSR mindfulness training relative to wait-list controls (Jha, Krompinger, & Baime, 2007). Another study that reported improvements in attention involved undergraduate students after completing 5-day meditation period and reported better selective

attention performance (Tang et al., 2007). In addition, working memory improvements as a consequence of mindfulness training were also reported in young adults, with mindfulness practice time related to greater working memory capacity (Jha et al., 2010; Zeidan et al., 2010). However, in terms of set-shifting, healthy young adults who completed an 8-week MBSR program showed no improvements during the task-switching paradigm when compared to the waitlist controls. As evident, there is still much debate about the role of cognitive control in relation to mindfulness, and further research, specifically with older adults, must be conducted.

Cross-sectional studies, rather than intervention studies, investigating the association between mindfulness disposition and cognitive control are more limited. In a sample of early adolescents, increased mindfulness disposition levels, indicated by higher scores on the MAAS, significantly predicted greater percent accuracy scores on the computerized Dots task, a test of inhibitory control; these results held when controlling for gender, grade, and participants' cortisol levels (Oberle, Schonert-Reichl, Lawlor, & Thomson, 2012). Increased mindfulness disposition levels were also associated with increased cognitive control, measured using tasks of working-memory, temporal-order, and inhibitory control, in a sample of college-aged students (Anicha, Ode, Moeller, & Robinson, 2012). Walsh, Balint, Smolira SJ, Fredericksen, & Madsenfound (2009) also found that attentional control was associated with trait levels of mindfulness disposition such that increased self-reported attentional control abilities significantly predicted increased mindfulness disposition levels. Furthermore, attentional control partially mediated the relationship between mindfulness disposition and trait anxiety levels (Walsh, Balint, Smolira SJ, Fredericksen, & Madsen, 2009).

There were a few limitations to note about this current study. As stated previously, this is a correlational study examining only relationships at one point in time. In order to truly

determine whether there are certain directionality and underlying mechanisms of mindfulness, the best mode of study would be to construct and carry out an intervention study. Second, our sample of older adults is limited to a certain age range, is highly educated, with a majority of participants being female. In terms of application, it may be difficult to extrapolate these findings out to the general public without additional investigation of a more diverse and representative sample.

This is the first study to simultaneously investigate the mediational role of emotion regulation and cognitive control in the relationship between mindfulness disposition and perceived stress in the elderly. As anticipated, mindfulness disposition and perceived stress were negatively associated in our older adult sample. Furthermore, emotion regulation capacity, measured via perceived difficulties in emotion regulation and tendency towards thought suppression mediated this relationship. In other words, emotional control explained the indirect effect of mindfulness disposition on perceived stress levels. However, cognitive control was not found to be associated with either perceived stress or mindfulness disposition in our older adult sample. Research investigating the relationship of cognitive control with mindfulness and stress needs to be further examined, particularly in the elderly, a population which is currently understudied in mindfulness research relative to young adults, and given that they exhibit an aging paradox such that cognitive control declines though emotional control is enhanced.

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Table 1.

*Study Sample Demographics and Characteristics of Older Adult Participants*

Demographic	Category	Number (%) or Mean (SD)
Age	---	65.34 (4.80)
Education	---	17.02 (2.35)
Gender	Male	18 (36%)
	Female	32 (64%)
MAAS	---	4.54 (0.51)
PSS	---	9.15 (5.43)
DERS	Sum	63.52 (12.47)
	Awareness	14.52 (3.61)
	Clarity	8.46 (2.45)
	Goals	10.86 (3.42)
	Impulse	8.54 (2.44)
	Non-acceptance	9.86 (3.70)
	Strategies	11.60 (3.55)
WBSI	---	35.95 (11.75)
NbackRTCost (ms)	---	165.74 (118.02)
NbackAccCost	---	0.24 (0.15)
FlankerRTCost (ms)	---	84.72 (74.86)
FlankerAccCost	---	0.04 (0.05)
TSGlobalRTCost (ms)	---	213.09 (113.43)
TSGlobalAccCost	---	-0.02 (0.10)
TSLocalRTCost (ms)	---	256.05 (120.27)
TSLocalAccCost	---	0.02 (0.04)

*Note.*  $N = 50$  OA. Data listed in the table represent raw scores prior to transformation.

Table 2.

*Pearson's Correlations Between Mindfulness Disposition, Perceived Stress, and Emotion Regulation Capacity in Older Adults.*

	1	2	3	4
1. MAAS	-	-.39*	-.54**	-.34*
2. PSS		-	.54**	.44*
3. DERS			-	.56**
4. WBSI				-

*Note.*  $N = 50$  OA. Higher numbers reflect higher MAAS, higher PSS, higher difficulties in emotion regulation, and increased thought suppression tendencies.  $^{\dagger}p \leq .1$ ,  $*p \leq .05$ ,  $**p \leq .001$ .

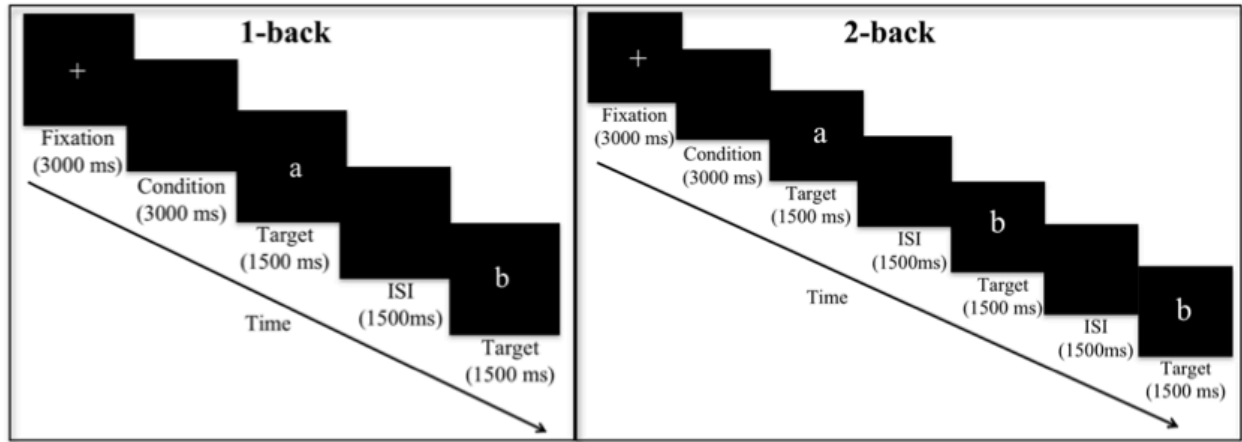


Table 3.

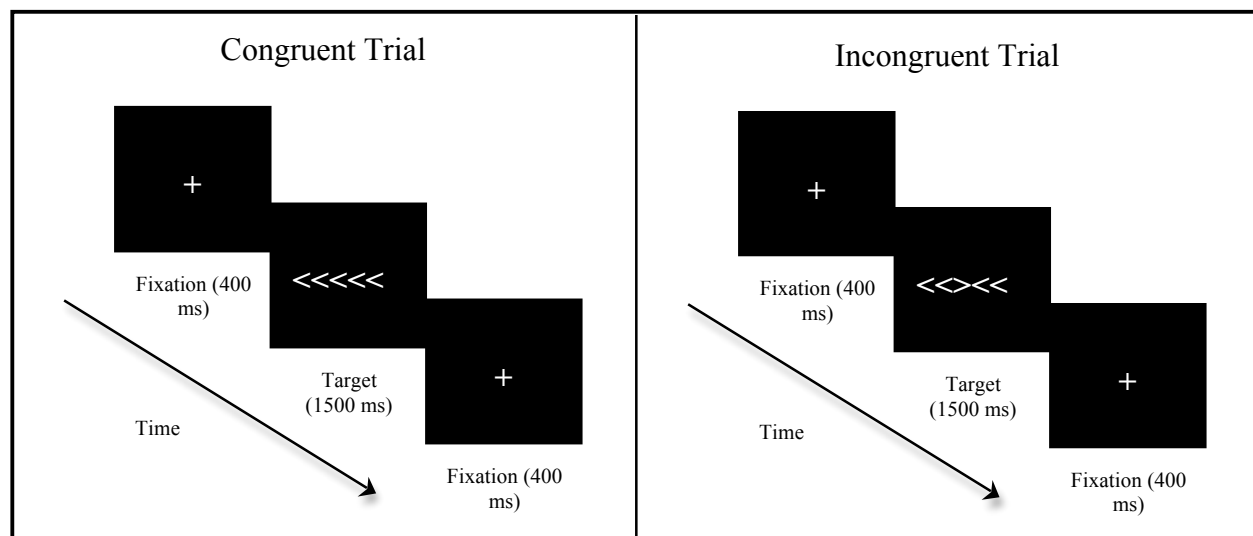
*Pearson's Correlations Between Mindfulness Disposition, Perceived Stress, and Cognitive Control Capacity in Older Adults.*

	1	2	3	4	5	6	7	8	9	10
1.MAAS	-	-.39*	.19	.01	.10	-.09	-.02	.01	-.04	-.02
2.PSS		-	-.15	-.10	-.17	.15	.01	-.02	-.09	.28
3.Nback RTCost			-	.17	-.23	-.06	-.08	-.01	.05	-.05
4.Nback AccCost				-	.13	-.21	.40*	.38	-.16	-.40*
5.Flanker RTCost					-	.18	-.10	-.12	-.04	-.11
6.Flanker AccCost						-	-.01	.26	.01	.24
7.TSGlobal RTCost							-	.08	-.41*	-.21
8.TSGlobal AccCost								-	-.19	-.00
9.TSLocal RTCost									-	.04
10.TSLocal AccCost										-

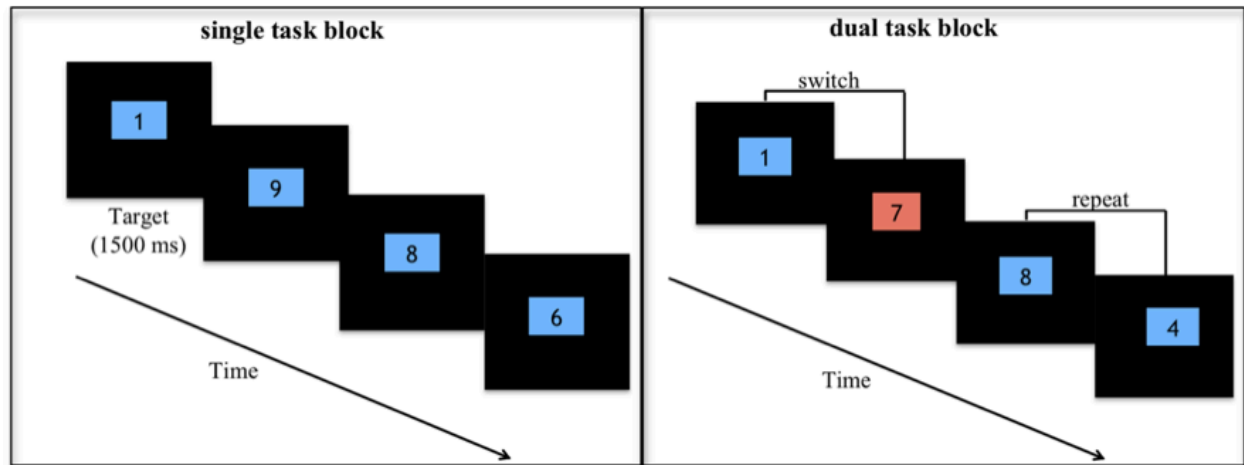
*Note.*  $N = 50$  OA. Higher numbers reflect higher MAAS, higher PSS, higher RTCost, and higher AccCost.  $^{\dagger}p \leq .1$ ,  $*p \leq .05$ ,  $**p \leq .001$ .



*Figure 1.* A schematic representation of the N-back task of working memory. Participants were asked to indicate whether or not the letter on the screen matched the one before it (1-back) or matched the letter the presented to letters back (2-back).



*Figure 2.* A schematic representation of the Flanker Task of inhibitory control. Participants were asked to indicate which direction the central arrow is pointing during congruent flanking arrows (congruent trials) and during incongruent flanking arrows (incongruent trials).



*Figure 3.* A schematic representation of the Task-Switching Paradigm of set shifting.

Participants completed two blocks of single tasks (single task block), and one block of dual task performance (dual task block). The single task block required participants to maintain a single attention set, while the dual task block required participants to switch and alter their responses based on the background color of the stimuli. The dual task block consisted of trials that switched in task from the previous trial (switch trials) and trials whose tasks remained the same from the previous trials (repeat trials).

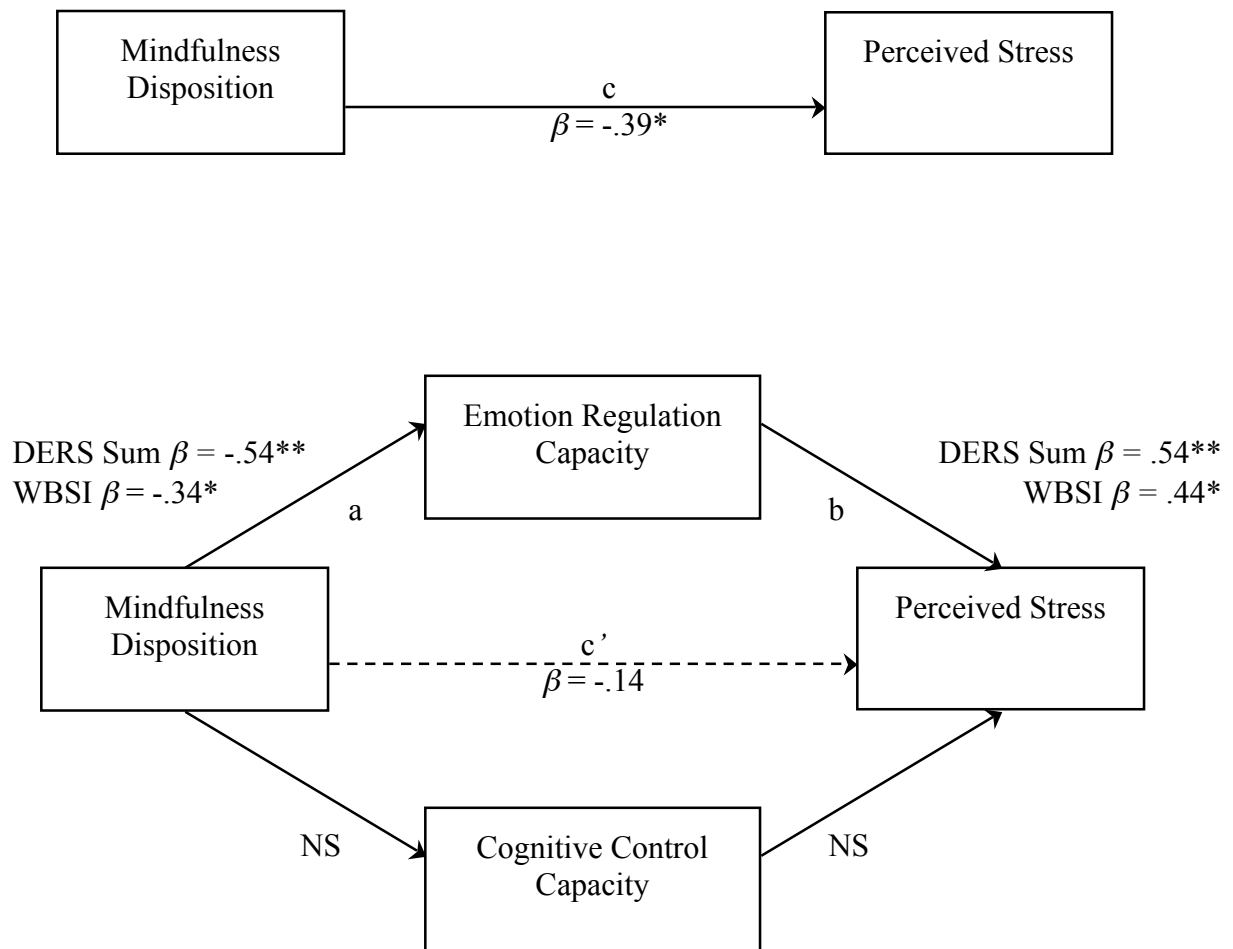


Figure 4. Path models of the direct effect of mindfulness disposition on perceived stress (top) and of the indirect mediated effect of emotion regulation capacity (top) in older adults on the basis of Baron & Kenny (1986). Dotted lines indicate that the mediators were controlled for.

Note: N = 50. Beta coefficients are standardized. NS denotes non-significance.  $^{\dagger}p \leq .1$ ,  $*p \leq .05$ ,  $**p \leq .001$ .

## Appendix 1.

**Mindfulness Attention Awareness Scale (MAAS)**

Below is a collection of statements about your everyday experiences. Using the 1-6 scale below, please indicate how frequently or infrequently you have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be.

1-----2-----3-----4-----5-----6  
Almost Always Almost Never

- \_\_\_\_\_ 1. I could be experiencing some emotion, and not be conscious of it until some time later.
- \_\_\_\_\_ 2. I break or spill things because of carelessness, not paying attention, or thinking of something else.
- \_\_\_\_\_ 3. I find it difficult to stay focused on what's happening in the present.
- \_\_\_\_\_ 4. I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.
- \_\_\_\_\_ 5. I tend not to notice feelings of tension or physical discomfort until they really grab my attention.
- \_\_\_\_\_ 6. I forget a person's name almost as soon as I've been told it for the first time.
- \_\_\_\_\_ 7. It seems I am "running on automatic" without much awareness of what I'm doing.
- \_\_\_\_\_ 8. I rush through activities without being really attentive to them.
- \_\_\_\_\_ 9. I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.
- \_\_\_\_\_ 10. I do jobs or tasks automatically, without being aware of what I am doing.
- \_\_\_\_\_ 11. I find myself listening to someone with one ear, doing something else at the same time.
- \_\_\_\_\_ 12. I drive places on "automatic pilot" and then wonder why I went there.
- \_\_\_\_\_ 13. I find myself preoccupied with the future or the past.
- \_\_\_\_\_ 14. I find myself doing things without paying attention.
- \_\_\_\_\_ 15. I snack without being aware that I am eating.

## Appendix 2.

## Perceived Stress Scale

The questions in this scale ask you about your feelings and thoughts **during the last month**. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

Name \_\_\_\_\_ Date \_\_\_\_\_

Age \_\_\_\_\_ Gender (*Circle*): **M** **F** Other \_\_\_\_\_

**0 =Never    1 =Almost Never    2 =Sometimes    3 =Fairly Often    4 =Very Often**

- |   |          |          |          |          |          |
|---|----------|----------|----------|----------|----------|
| 1. In the last month, how often have you been upset because of something that happened unexpectedly?.....                 | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 2. In the last month, how often have you felt that you were unable to control the important things in your life?.....     | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 3. In the last month, how often have you felt nervous and "stressed"? .....   | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 4. In the last month, how often have you felt confident about your ability to handle your personal problems?.....         | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 5. In the last month, how often have you felt that things were going your way?.....                                       | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 6. In the last month, how often have you found that you could not cope with all the things that you had to do? .....      | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 7. In the last month, how often have you been able to control irritations in your life?.....                              | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 8. In the last month, how often have you felt that you were on top of things?.....  | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 9. In the last month, how often have you been angered because of things that were outside of your control? .....          | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |
| 10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?..... | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> |

## Appendix 3.

**Difficulties in Emotion Regulation Scale (DERS)**

**Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.**

1-----	2-----	3-----	4-----	5
almost never	sometimes	about half the time	most of the time	
almost always				
(0-10%)	(11-35%)	(36-65%)	(66-90%)	
(91-100%)				

- \_\_\_\_\_ 1) I am clear about my feelings.
- \_\_\_\_\_ 2) I pay attention to how I feel.
- \_\_\_\_\_ 3) I experience my emotions as overwhelming and out of control.
- \_\_\_\_\_ 4) I have no idea how I am feeling.
- \_\_\_\_\_ 5) I have difficulty making sense out of my feelings.
- \_\_\_\_\_ 6) I am attentive to my feelings.
- \_\_\_\_\_ 7) I know exactly how I am feeling.
- \_\_\_\_\_ 8) I care about what I am feeling.
- \_\_\_\_\_ 9) I am confused about how I feel.
- \_\_\_\_\_ 10) When I'm upset, I acknowledge my emotions.
- \_\_\_\_\_ 11) When I'm upset, I become angry with myself for feeling that way.
- \_\_\_\_\_ 12) When I'm upset, I become embarrassed for feeling that way.
- \_\_\_\_\_ 13) When I'm upset, I have difficulty getting work done.
- \_\_\_\_\_ 14) When I'm upset, I become out of control.
- \_\_\_\_\_ 15) When I'm upset, I believe that I will remain that way for a long time.
- \_\_\_\_\_ 16) When I'm upset, I believe that I will end up feeling very depressed.



1-----	2-----	3-----	4-----	5
almost never	sometimes	about half the time	most of the time	
almost always				
(0-10%)	(11-35%)	(36-65%)	(66-90%)	
(91-100%)				

- \_\_\_\_\_ 17) When I'm upset, I believe that my feelings are valid and important.
- \_\_\_\_\_ 18) When I'm upset, I have difficulty focusing on other things.
- \_\_\_\_\_ 19) When I'm upset, I feel out of control.
- \_\_\_\_\_ 20) When I'm upset, I can still get things done.
- \_\_\_\_\_ 21) When I'm upset, I feel ashamed at myself for feeling that way.
- \_\_\_\_\_ 22) When I'm upset, I know that I can find a way to eventually feel better.
- \_\_\_\_\_ 23) When I'm upset, I feel like I am weak.
- \_\_\_\_\_ 24) When I'm upset, I feel like I can remain in control of my behaviors.
- \_\_\_\_\_ 25) When I'm upset, I feel guilty for feeling that way.
- \_\_\_\_\_ 26) When I'm upset, I have difficulty concentrating.
- \_\_\_\_\_ 27) When I'm upset, I have difficulty controlling my behaviors.
- \_\_\_\_\_ 28) When I'm upset, I believe there is nothing I can do to make myself feel better.
- \_\_\_\_\_ 29) When I'm upset, I become irritated at myself for feeling that way.
- \_\_\_\_\_ 30) When I'm upset, I start to feel very bad about myself.
- \_\_\_\_\_ 31) When I'm upset, I believe that wallowing in it is all I can do.
- \_\_\_\_\_ 32) When I'm upset, I lose control over my behavior.
- \_\_\_\_\_ 33) When I'm upset, I have difficulty thinking about anything else.
- \_\_\_\_\_ 34) When I'm upset I take time to figure out what I'm really feeling.
- \_\_\_\_\_ 35) When I'm upset, it takes me a long time to feel better.
- \_\_\_\_\_ 36) When I'm upset, my emotions feel overwhelming.

## Appendix 4.

**WBSI**

This survey is about thoughts. There are no right or wrong answers, so please respond honestly to each of the items below. Be sure to answer every item by circling the appropriate letter beside each.

A	B	C	D	E
Strongly Disagree	Disagree	Neutral or Don't Know	Agree	Strongly Agree

- A B C D E    1. There are things I prefer not to think about.
- A B C D E    2. Sometimes I wonder why I have the thoughts I do.
- A B C D E    3. I have thoughts that I cannot stop.
- A B C D E    4. There are images that come to mind that I cannot erase.
- A B C D E    5. My thoughts frequently return to one idea.
- A B C D E    6. I wish I could stop thinking of certain things.
- A B C D E    7. Sometimes my mind races so fast I wish I could stop it.
- A B C D E    8. I always try to put problems out of mind.
- A B C D E    9. There are thoughts that keep jumping into my head.
- A B C D E    10. There are things that I try not to think about.
- A B C D E    11. Sometimes I really wish I could stop thinking.
- A B C D E    12. I often do things to distract myself from my thoughts.
- A B C D E    13. I have thoughts that I try to avoid.
- A B C D E    14. There are many thoughts that I have that I don't tell anyone.
- A B C D E    15. Sometimes I stay busy just to keep thoughts from intruding on my mind.